```
         ********************************************
         *** ATARI 520ST hardware document ***
         ********************************************
```

*** memory configuration

```
_____
FF8001 RW ....cccc   memory configuration
            ||||  bank0  bank1
            0000-  128k   128k
            0001-  128k   512k
            0010-  128k  2048k
            0011- *reserved*
            0100-  512k   128k
            0101-  512k   512k
            0110-  512k  2048k
            0111- *reserved*
            1000- 2048k   128k
            1001- 2048k   512k
            1010- 2048k  2048k
            1011- *reserved*
            1100- *reserved*
            1101- *reserved*
            1110- *reserved*
            1111- *reserved*
```

*** video controller

```
_____
FF8201 RW bbbbbbbb  video base high
FF8203 RW bbbbbbbb  video base mid
FF8205 R  cccccccc  video address counter high
FF8207 R  cccccccc  video address counter mid
FF8209 R  cccccccc  video address counter low
FF820A RW ......mm  sync mode
            |+- external (internal) sync
            +-- 50 (60) Hz vsync
FF8240 RW .....rrr.ggg.bbb  palette color 0, border & monochrome invert
FF8242 RW .....rrr.ggg.bbb  palette color 1
FF8244 RW .....rrr.ggg.bbb  palette color 2
FF8246 RW .....rrr.ggg.bbb  palette color 3
FF8248 RW .....rrr.ggg.bbb  palette color 4
FF824A RW .....rrr.ggg.bbb  palette color 5
FF824C RW .....rrr.ggg.bbb  palette color 6
FF824E RW .....rrr.ggg.bbb  palette color 7
FF8250 RW .....rrr.ggg.bbb  palette color 8
FF8252 RW .....rrr.ggg.bbb  palette color 9
FF8254 RW .....rrr.ggg.bbb  palette color A
FF8256 RW .....rrr.ggg.bbb  palette color B
FF8258 RW .....rrr.ggg.bbb  palette color C
FF825A RW .....rrr.ggg.bbb  palette color D
FF825C RW .....rrr.ggg.bbb  palette color E
FF825E RW .....rrr.ggg.bbb  palette color F
FF8260 RW ......ss  shift mode
            ||
            00- 320x200, 16 color
            01- 640x200, 4 color
            10- 640x400, monochrome
            11- reserved
```

video bitmap:

```
        320x200:
bit0:   word0  FEDCBA9876543210     word4  FEDCBA9876543210     word8  FEDCBA9876543210
bit1:   word1  FEDCBA9876543210     word5  FEDCBA9876543210     word9  FEDCBA9876543210
bit2:   word2  FEDCBA9876543210     word6  FEDCBA9876543210     wordA  FEDCBA9876543210
bit3:   word3  FEDCBA9876543210     word7  FEDCBA9876543210     wordB  FEDCBA9876543210

        640x200:
bit0:   word0  FEDCBA9876543210     word2  FEDCBA9876543210     word4  FEDCBA9876543210
bit1:   word1  FEDCBA9876543210     word3  FEDCBA9876543210     word5  FEDCBA9876543210

        640x400:
bit0:   word0  FEDCBA9876543210     word1  FEDCBA9876543210     word2  FEDCBA9876543210
```

*** *reserved*

```
FF8400 ..  ........   *reserved*
```

*** DMA/disk

```
FF8600 ..  .................   *reserved*
FF8602 ..  .................   *reserved*
FF8604 RW  ........cccccccc    disk controller
FF8606 R   .............sss    DMA status
                        | |+-  error status
                        |+---  sector count zero status
                        +----  data request inactive status
       W   ........ccccccc.    DMA mode control
                |||||||||+---  A0
                ||||||| +----  A1
                ||||||+-----   HDC (FDC) register select
                |||||+------   sector count register select
                |||0          *reserved*
                ||+---------  disable (enable) DMA
                |+----------  FDC (HDC)
                +-----------  write (read)
FF8609 RW  cccccccc   DMA base and counter high
FF860B RW  cccccccc   DMA base and counter mid
FF860D RW  cccccccc   DMA base and counter low
```

*** AY-3-8910 integrated sound generator

```
---------------------------------------------------------------------------------
FF8800 R   dddddddd   read data
        W   ....ssss   register select
                |||| register  function
            0000- pppppppp  channel A period low
            0001- ....pppp  channel A period high
            0010- pppppppp  channel B period low
            0011- ....pppp  channel B period high
            0100- pppppppp  channel C period low
            0101- ....pppp  channel C period high
            0110- ...nnnnn  noise period
            0111- sssnnnpp  mixer and I/O control
                |||||||+-- parallel port B out (in)
                ||||||+--- parallel port A out (in)
                |||||+---- channel C noise disable
                ||||+----- channel B noise disable
                |||+------ channel A noise disable
                ||+------- channel C sound disable
                |+-------- channel B sound disable
                +--------- channel A sound disable
            1000- ...eaaaa  channel A amplitude or envelope enable
            1001- ...eaaaa  channel B amplitude or envelope enable
            1010- ...eaaaa  channel C amplitude or envelope enable
            1011- pppppppp  envelope period low
            1100- pppppppp  envelope period high
            1101- .....eee  envelope type
                     ||| form
                000- \|\|\|\
                001- _____
                010- \/\/\/\
                011- \|""""""
                100- /|/|/|/
                101- /"""""""
                110- /\/\/\/
                111- /|_____
            1110- dddddddd  I/O port A data
                |||||||+- floppy side 0 (1) select
                ||||||+-- disk drive A (select)
                |||||+--- disk drive B (select)
                ||||+---- RS232 request to send
                |||+----- RS232 data terminal ready
                ||+------ centronics (strobe)
                |+------- general purpose output
                +-------- *reserved*
            1111- dddddddd  I/O port B data, centronics port
FF8802  W  dddddddd   write data
```

```
*** MC68901 MFP multi-function-controller
---------------------------------------------------------------------------
FFFA01 RW iiiiiiii   interrupt & supervision lines
          |||||||+-- centronics busy
          ||||||+--- RS232 data carrier detect
          |||||+---- RS232 clear to send
          ||||+----- GPU operation done
          |||+------ keyboard & midi
          ||+------- disk drive controller
          |+-------- RS232 ring indicator
          +--------- monochrome monitor detect
FFFA03 RW rrrrrrrr   active edge, 1=rising, 0=falling
FFFA05 RW dddddddd   data direction, 1=output, 0=input
FFFA07 RW eeeeeeee   interrupt enable low
FFFA09 RW eeeeeeee   interrupt enable high
FFFA0B RW pppppppp   interrupt pending low
FFFA0D RW pppppppp   interrupt pending high
FFFA0F RW ssssssss   interrupt in-service low
FFFA11 RW ssssssss   interrupt in-service high
FFFA13 RW mmmmmmmm   interrupt mask low
FFFA15 RW mmmmmmmm   interrupt mask high
FFFA17 RW vvvvs...   vector & in-service enable
          ||||+----- in-service enable
          ++++------ interrupt vector high portion
FFFA19 RW ...rcccc   timer TA control
FFFA1B RW ...rcccc   timer TB control
             |||||   mode         prescale
             |0000-  stop           -
             |0001-  delay          4
             |0010-  delay          10
             |0011-  delay          16
             |0100-  delay          50
             |0101-  delay          64
             |0110-  delay          100
             |0111-  delay          200
             |1000-  event count    -
             |1001-  pulse width    4
             |1010-  pulse width    10
             |1011-  pulse width    16
             |1100-  pulse width    50
             |1101-  pulse width    64
             |1110-  pulse width    100
             |1111-  pulse width    200
             +-----  reset timer
FFFA1D RW .ccc.ccc   timers TC & TD control
            ||| |||   mode      prescale
            000-000-  stop        -
            001-001-  delay       4
            010-010-  delay       10
            011-011-  delay       16
            100-100-  delay       50
            101-101-  delay       64
            110-110-  delay       100
            111-111-  delay       200
           (TC) (TD)
FFFA1F RW dddddddd   TA data
FFFA21 RW dddddddd   TB data
FFFA23 RW dddddddd   TC data
FFFA25 RW dddddddd   TD data
```

```
FFFA27 RW  ssssssss   sync character
FFFA29 RW  ccccccc.   USART control
           |||||||+--- even (odd) parity
           ||||||+---- parity enable
           |||||      start   stop   format
           ||||00----    0       0    sync
           ||||01----    1       1    async
           ||||10----    1      1.5   async
           ||||11----    1       2    async
           |||        word length (bits)
           ||00------         8
           ||01------         7
           ||10------         6
           ||11------         5
           +--------- /16 (/1)
FFFA2B RW  ssssssss   receiver status
           |||||||+-  receiver enable
           ||||||+--  sync strip enable
           |||||+---  match/character in progress
           ||||+----  found/search or break detect
           |||+-----  frame error
           ||+------  parity error
           |+-------  overrun error
           +--------  buffer full
FFFA2D RW  ssssssss   transmitter status
           |||||||+-  transmitter enable
           |||||||    serial output state
           ||||||00-- HI-Z
           ||||||01-- LOW
           ||||||10-- HIGH
           ||||||11-- LOOP
           ||||+----- break
           |||+------ end of transmission
           ||+------- auto turnaround
           |+-------- underrun error
           +--------- buffer empty
FFFA2F RW  ddddddd    USART data
```

*** MC6850 ACIA keyboard

```
FFFC00 R   ssssssss   ACIA status
           ||||||||+- receive data register full
           |||||||+-- transmit data register empty
           ||||||+--- (data carrier detect)
           |||||+---- (clear to send)
           ||||+----- framing error
           |||+------ receiver overrun
           ||+------- parity error
           |+-------- interrupt request
       W   cccccccc   ACIA control
           ||||||||   mode   prescale
           ||||||00-  rtx       1
           ||||||01-  rtx      16
           ||||||10-  rtx      64
           ||||||11-  reset
           |||||      length  parity   stop bits
           |||000----    7      even       2
           |||001----    7      odd        2
           |||010----    7      even       1
           |||011----    7      odd        1
           |||100----    8      -          2
           |||101----    8      -          1
           |||110----    8      even       1
           |||111----    8      odd        1
           |||
           |00------- (RTS)=low, tx interrupt disabled
           |01------- (RTS)=low, tx interrupt enabled
           |10------- (RTS)=high, tx interrupt disabled
           |11------- (RTS)=low, tx interrupt disabled,
           |                    transmits a break level on
           |                    the transmit data output
           +--------- rx interrupt enable
FFFC02 RW  dddddddd   ACIA data
```

*** MC6850 ACIA MIDI

```
FFFC04 R   ssssssss   ACIA status  (-> kbd)
       W   cccccccc   ACIA control (-> kbd)
FFFC06 RW  dddddddd   ACIA data
```

****

*** interrupt structure
----

level   definition
  7 (high)
  6   MC68901 MFP
  5
  4   VSYNC
  3
  2   HSYNC
  1 (low)

MC68901 MFP interrupts

priority   definition
    F (high) monochrome monitor detect
    E   RS232 ring indicator
    D   TA (system clock)
    C   RS232 receive buffer full
    B   RS232 receive error
    A   RS232 transmit buffer empty
    9   RS232 transmit error
    8   TB (hsync)
    7   disk drive controller
    6   keyboard & MIDI
    5   TC ( )
    4   TD (RS232 baud rate generator)
    3   GPU operation done
    2   RS232 clear to send
    1   RS232 data carrier detect
    0 (low)   centronics busy

****